Small Business Innovation Research/Small Business Tech Transfer

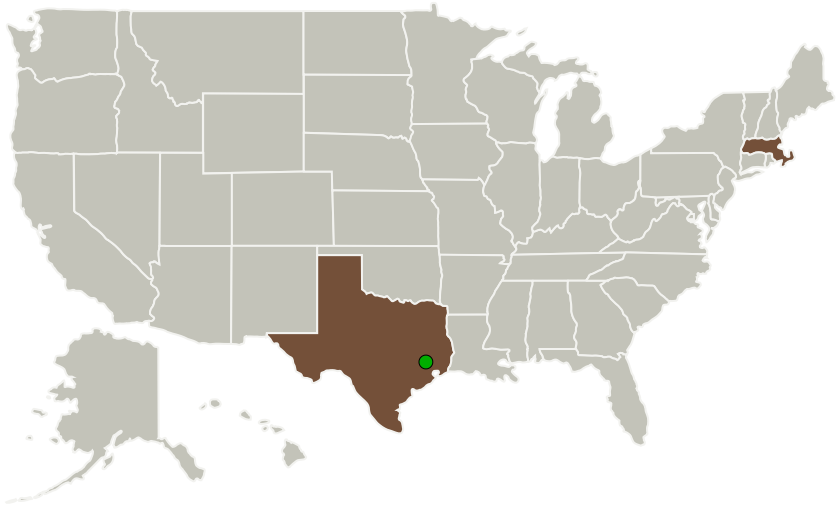
Suit Simulator (S3) for Partial Gravity EVA Experimentation and Training, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Aurora Flight Sciences, along with MIT consultants Professor Dava Newman and Professor Jeffrey Hoffman, propose to develop an EVA space suit simulator for use in partial gravity training and experimentation. Our space suit simulator will provide a lightweight, low form-factor solution to microgravity and partial gravity EVA experimentation and training. We will utilize magnetorheological (MR) fluids as our damping device in order to minimize weight and space, and will careful select supplementary stiffness devices to best emulate the mechanical properties of the EMU. We propose to develop this simulator by first characterizing the joint torque requirements using MIT's unique database of joint torques obtained from 1990 to present with the Robotic Space Suit Tester (RSST). After conducting this literature survey, we will obtain test samples of MR fluids and stiffness components, in order to recognize the best method of simulating the mechanical characteristics of a pressurized EMU. These stiffness and damping components will be tested on MIT's RSST in a simplified configuration (single-axis joint) to verify consistent emulation of the EMU joint. Identification of the stiffness and damping technologies will allow us to provide a top-level conceptual design of a full space suit simulator, including all joints as well as the garment in its entirety.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

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Primary U.S. Work Locations	
Massachusetts	Texas

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137339)*

Project Management

Program Director:

Jason L Kessler

Program Manager:

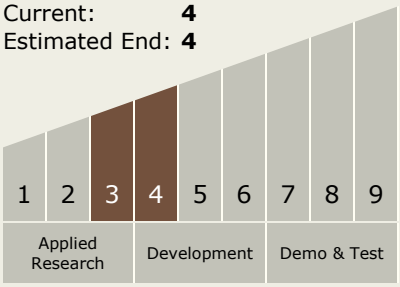
Carlos Torrez

Principal Investigator:

Jessica Edmonds

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.2 Prevention and Countermeasures

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Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System